

CLAIMS

1. A selective, direct chemical, anti-carcinogenic action filtration method for filtering toxic products, in particular polycyclic aromatic hydrocarbons (PAH) such as benzo(a)pyrene (BaP) and nitrosamines, contained in the tobacco smoke of a cigarette; said method comprising the step for controlling the level of toxic products as compared with that of nicotine in order that the level reduction at the output of the filter is larger than a predetermined threshold,

(so that nicotine and taste aromas are preserved for the satisfaction and pleasure of smokers);

in order to control the toxic product level as compared with that of nicotine, notably the level of polycyclic aromatic hydrocarbons (PAH) and nitrosamines, said method comprises the following steps:

- the step for scavenging all or part of the toxic products by means of an active ingredient acting on said toxic products according to molecular processes comparable to those according to which DNA and/or RNA of the human cell react with regards to said toxic products,

- the step for controlling the operating conditions of the filter by operating in a substantially non-aqueous medium and with a basic pH, preferably larger than or equal to 8,

- the step for adjusting the mass of the active ingredient so that it is larger than or equal to 0.1% of the mass of the

cigarette filter and preferably larger than or equal to 1% of the mass of the filter.

2. The method according to claim 1, such that said active ingredient consists of molecules formed by one or more  
5 nitrogen-containing cycles or nitrogen-containing heterocycles and particularly nitrogen-containing heteroaromatic cycles, notably pentacycles or hexacycles or a combination of both; said active ingredient existing as:

- a chain of said molecules and/or
- 10 - said molecules bound in a common chemical arrangement to one fiber, notably a fiber consisting of cellulose acetate.

3. The method according to claim 2, such that the molecule of the active ingredient is DNA and/or RNA and/or a  
15 DNA or RNA derivative, such as for example adenosine triphosphate (ATP), cyclic adenosine monophosphate (AMP), adenylcyclase.

4. Cigarette filter with a selective, direct chemical, anti-carcinogenic action, particularly for filtering polycyclic  
20 aromatic hydrocarbons (PAH), notably benzo(a)pyrene (BaP), as well as nitrosamines, while preserving the nicotine level and taste aromas for the satisfaction and the pleasure of the smoker;

said filter including an active ingredient consisting of  
25 molecules formed by one or more nitrogen-containing cycles or nitrogen-containing heterocycles, and in particular nitrogen-containing heteroaromatic cycles, notably pentacycles or hexacycles or a combination of both; said active ingredient existing as:

- 30 - a chain of said molecules and/or
  - said molecules bound to a fiber in a common chemical arrangement, notably a fiber consisting of cellulose acetate;
- the mass of said nitrogen-containing cycles or heterocycles and particularly nitrogen-containing

heteroaromatic cycles being at least equal to or larger than 0.1% of the total mass of the filter;

5 said nitrogen-containing cycles or heterocycles and particularly nitrogen-containing heteroaromatic cycles operating in a substantially non-aqueous medium and with a basic pH,

10 *(in such a way that it is thus possible to substantially reduce, at the output of the filter, the level of polycyclic aromatic hydrocarbons as compared with nicotine, notably by more than 90%, while preserving the nicotine level and the taste aromas for the satisfaction and pleasure of the smoker).*

5. The filter according to claim 4, such that the molecules are formed as a polymer, in the broad sense.

15 6. The filter according to any of claims 4 or 5, such that the active ingredient exclusively consists of said molecules and/or said polymers.

20 7. The cigarette filter according to any of claims 4 to 6, such that the mass of said nitrogen-containing cycles or heterocycles, and particularly nitrogen-containing heteroaromatic cycles, is at least equal to or larger than 1% of the total mass of the filter.

8. The cigarette filter according to any of claims 4 to 7, such that the moisture content of the filter lies between 5 and 10%.

25 9. The cigarette filter according to any of claims 4 to 8, such that the pH of the filter is larger than 8.

30 10. The cigarette filter according to any of claims 4 to 9, such that the molecule of the active ingredient is DNA and/or RNA and/or a DNA or RNA derivative, such as for example, adenosine triphosphate (ATP), cyclic adenosine monophosphate or adenylylase,

35 *(in such a way that the carcinogenic toxic products contained in tobacco smoke, affecting the DNA and/or RNA molecules of the human cell, are scavenged by the filter according to molecular processes comparable to those*

according to which said toxic products act on DNA and/or RNA of the human cell).

11. The filter according to any of claims 4 to 10, such that at least one function selected from a group comprising the following functions:

- amine  $\text{NH}_2$ ,
- ketone, aldehyde,
- methyl,
- alkene, alkyl, or aryl,

10 is added to the molecule of the active ingredient, on at least one of the nitrogen-containing cycles or nitrogen-containing heterocycles, and particularly the nitrogen-containing heteroaromatic cycles.

12. The filter according to any of claims 4 to 11, such that one or more sugars, such as ribose or deoxyribose, are added to at least one molecule of the active ingredient.

13. The filter according to any of claims 4 to 12, such that one or more acid functions, notably pentavalent phosphoric acid ( $\text{H}_3\text{PO}_4$ ) and/or another molecule including a trivalent phosphorus atom are added to at least one molecule of the active ingredient.

14. The filter according to any of claims 4 to 13, such that polymerization is performed in the broad sense at the nitrogen-containing cycles, i.e. nitrogen-containing heterocycles and particularly nitrogen-containing heteroaromatic cycles and/or added functions and/or acids and/or sugars.

15. The filter according to any of claims 4 to 14, such that the molecule of the active ingredient includes one or more atoms and/or one or more molecules and/or one or more radicals and/or one or more ions of a halogen, such as notably fluorine.

16. The filter according to any of claims 4 to 15, such that the molecule of the active ingredient is in a halogen salt medium, notably in a sodium fluoride ( $\text{NaF}$ ) salt medium.

17. The filter according to any of claims 4 to 16, such that said fibers are partly halogenated, such as notably by fluorine and/or are in a medium including atoms, molecules, radicals or ions of a halogen, such as notably fluorine.

5        18. A method for manufacturing a filter including molecules and/or fibers according to any of claims 4 to 17, said method comprising the step consisting of extruding and/or rolling together said molecules and said fibers.

10       19. A filtration device including molecules and/or fibers according to any of claims 4 to 18.

add A4 → 20. The filtration device according to claim 19, such that said molecules and/or said fibers are incorporated in separate compartments.

15       21. The filtration device according to any of claims 19 or 20, such that said molecules and/or said fibers exist in a gelatinous, liquid or gaseous physical state.

22. The application of the filtration device according to any of claims 19 to 21, to the selective filtration of toxic products.

20       23. A cigarette including a filtration device according to any of claims 19 to 21.

add A5 →  
add B3 →